



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/588,619	06/06/2000	William J. Dally	2390.1013001	1071

21005 7590 05/10/2004

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

EXAMINER

NGUYEN, TOAN D

ART UNIT	PAPER NUMBER
----------	--------------

2665

DATE MAILED: 05/10/2004

9

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No

09/588,619

Applicant(s)

DALLY ET AL.

Examiner

Toan D Nguyen

Art Unit

2665

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 January 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-71 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 25-27, 58-60 and 69 is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☒ Claim(s) 6, 7, 10, 12, 16, 19, 22, 29-31, 39, 40, 45, 49, 52, 55 and 62-64 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Continuation of Disposition of Claims: Claims rejected are 1-5,8,9,11,13-15,17,18,20,21,23,24,28,32-38,41-48,50,51,53,54,56,57,61,65-68,70 and 71.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 32 and 71 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 32 line 8, it is unclear as to what is meant by "further scheduler". Similar problems exist in claim 71 line 8.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-5, 8-9, 11, 14-15, 23, 34-38, 41-42, 44, 47-48, 56 and 67 are rejected under 35 U.S.C. 102(e) as being anticipated by Li et al. (U.S. Patent 6,560,230 B1).

For claim 1, Li et al. disclose packet scheduling methods and apparatus comprising:

queues 55 storing data packets to be forwarded (figure 5A, col. 9 lines 7-13); and

a scheduler 50 which selects queues 55 from which packets are forwarded (figure 5, col. 8 lines 54-57), the scheduler comprising:

scheduling values associated with the queues (col. 8 lines 54-57); and

a selection network by which the scheduling values are compared to select packets to be forwarded (figure 4 and 5A, col. 6 lines 47-58 and col. 8 lines 61-67).

For claim 2, Li et al. disclose wherein the selection network is a tree structure where each leaf of the tree structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure (figure 5A, col. 6 lines 47-58 and col. 8 lines 61-67).

For claim 3, Li et al. disclose wherein the scheduler limits comparisons of scheduling values to a path through the tree structure from a leaf node representing a changed scheduling value to a root of the tree structure (figure 5A, col. 9 lines 27-34).

For claim 4, Li et al. disclose wherein the internal nodes of the tree structure store scheduling values from winning sibling nodes (figure 4, col. 7 lines 23-35).

For claim 5, Li et al. disclose wherein the internal nodes store identities of leaf nodes corresponding to the stored scheduling values (figure 4, col. 7 lines 23-35).

For claim 8, Li et al. disclose wherein the scheduler comprises pipeline stages, each of which compares scheduling values indicated by separate portions of the tree structure (figure 4, col. 7 lines 58-67).

For claim 9, Li et al. disclose wherein the scheduler comprises a random access memory partitioned across the pipeline stages, each partition storing at least one level of the tree structure (figure 5A, col. 7 lines 58-67 and col. 9 line 5).

For claim 11, Li et al. disclose wherein each node identifies a path to a winning leaf node (col. 9 lines 27-34).

For claim 14, Li et al. disclose wherein the scheduling values include scheduled transmission times according to a constant-bit-rate (CBR) service guarantee (figure 4, col. 7 lines 25-35).

For claim 15, Li et al. disclose wherein the scheduling values are updated to reflect variable packet links (figure 7, col. 14 lines 61-62).

For claim 23, Li et al. disclose wherein the selection network is a sorting network by which the scheduling values are compared to order the queues by scheduling priority (col. 6 lines 47-58).

For claim 34, Li et al. disclose packet scheduling methods and apparatus comprising: storing data packets in queues (figure 5A, col. 9 lines 7-13); associating scheduling values with the queues (col. 8 lines 54-57); and comparing scheduling values in a selection network to select queues from which packets are forwarded (figure 4 and 5A, col. 6 lines 47-58 and col. 8 lines 61-67).

For claim 35, Li et al. disclose wherein the selection network is a tree structure where each leaf of the tree structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure (figure 5A, col. 6 lines 47-58 and col. 8 lines 61-67).

For claim 36, Li et al. disclose wherein the scheduler limits comparisons of scheduling values to a path through the tree structure from a leaf node representing a changed scheduling value to a root of the tree structure (figure 5A, col. 9 lines 27-34).

For claim 37, Li et al. disclose wherein the internal nodes of the tree structure store scheduling values from winning sibling nodes (figure 4, col. 7 lines 23-35).

For claim 38, Li et al. disclose wherein the internal nodes store identities of leaf nodes corresponding to the stored scheduling values (figure 4, col. 7 lines 23-35).

For claim 41, Li et al. disclose comparing scheduling values indicated by separate portions of the tree structure in pipeline stages (figure 4, col. 7 lines 58-67).

For claim 42, Li et al. disclose storing at least one level of the tree structure in a partition of a random access memory (RAM) partitioned across the pipeline stages (figure 5A, col. 7 lines 58-67 and col. 9 line 5).

For claim 44, Li et al. disclose wherein each node identifies a path to a winning leaf node (col. 9 lines 27-34).

For claim 47, Li et al. disclose wherein the scheduling values include scheduled transmission times according to a constant-bit-rate (CBR) service guarantee (figure 4, col. 7 lines 25-35).

For claim 48, Li et al. disclose wherein the scheduling values are updated to reflect variable packet lengths (figure 7, col. 14 lines 61-62).

For claim 56, Li et al. disclose wherein the selection network is a sorting network by which the scheduling values are compared to order the queues by scheduling priority (col. 6 lines 47-58).

For claim 67, Li et al. disclose packet scheduling methods and apparatus comprising:
queues storing data packets to be forwarded queues 55 storing data packets to be forwarded (figure 5A, col. 9 lines 7-13); and

scheduling means for selecting queues from which packets are forwarded the scheduling means comprising:

scheduling values associated with the queues (col. 8 lines 54-57); and

Art Unit: 2665

a selection network by which the scheduling values are compared to select packets to be forwarded (figures 4 and 5A, col. 6 lines 47-58 and col. 8 lines 61-67).

4. Claims 32-33, 65-66 and 71 are rejected under 35 U.S.C. 102(e) as being anticipated by Ganmukhi et al. (U.S. Patent 5,850,399).

For claim 32, Ganmukhi et al. disclose hierarchical packet scheduling method and apparatus, comprising:

a first set of queues storing data packets to be forwarded (figure 1, col. 4 lines 19-20);

a first scheduler which selects queues of the first set of queues from which packets are forwarded to a first intermediate queue (figure 1, col. 4 lines 19-20);

a second set of queues storing data packets to be forwarded (figure 1, col. 4 lines 27-30);

a second scheduler which selects queues of the second set of queues from which packets are forwarded to a second intermediate queue (figure 1, col. 5 lines 13-14); and

a further scheduler which selects intermediate queues from which packets are forwarded (figure 1, col. 5 line 20-21).

For claim 33, Ganmukhi et al. disclose wherein the first scheduler selects queues according to plural scheduling methods (figure 1, col. 4 line 53 to col. 5 line 11).

For claim 65, Ganmukhi et al. disclose hierarchical packet scheduling method and apparatus, comprising:

storing data packets to be forwarded in first and second sets of queues (figure 1, col. 4 lines 19-20 and col. 4 lines 27-30);

selecting queues of the first set of queues from which packets are forwarded to a first intermediate queue (figure 1, col. 4 lines 19-20);

Art Unit: 2665

selecting queues of the second set of queues from which packets are forwarded to a second intermediate queue (figure 1, col. 4 lines 27-30);

selecting intermediate queues from which packets are forwarded (figure 1, col. 5 line 20-21).

For claim 66, Ganmukhi et al. disclose wherein the step of selecting queues of the first set of queues comprises selecting queues according to plural scheduling methods (figure 1, col. 4 line 53 to col. 5 line 11).

For claim 71, Ganmukhi et al. disclose hierarchical packet scheduling method and apparatus, comprising:

a first set of queues storing data packets to be forwarded (figure 1, col. 4 lines 19-20);

first scheduling means for selecting queues of the first set of queues from which packets are forwarded to a first intermediate queue (figure 1, col. 4 lines 19-20);

a second set of queues storing data packets to be forwarded (figure 1, col. 4 lines 27-30);

second scheduling means for selecting queues of the second set of queues from which packets are forwarded to a second intermediate queue (figure 1, col. 5 lines 13-14);

further scheduling means for selecting intermediate queues from which packets are forwarded (figure 1, col. 5 line 20-21).

5. Claims 24, 57 and 68 are rejected under 35 U.S.C. 102(e) as being anticipated by Bauman et al. (U.S. Patent 5,832,304).

For claim 24, Bauman et al. disclose memory queue with adjustable priority and conflict detection, comprising:

queues storing data packets to be forwarded (figure 5, col. 7 lines 44-46); and

Art Unit: 2665

a scheduler which selects queues from which packets are forwarded (figure 5, col. 8 lines 37-43), the scheduler comprising:

scheduling values associated with the queues (figure 8, col. 12 lines 4-7);

indicators associated with the queues to disable the queues (figure 9, col. 13 lines 7-26);

and

a comparator which compares scheduling values of queues which are not disabled to forward data packets therefrom (figure 8, col. 12 lines 25-28).

For claim 57, Bauman et al. disclose memory queue with adjustable priority and conflict detection, comprising:

storing data packets in queues (figure 5, col. 7 lines 44-46); and

associating scheduling values with the queues (figure 5, col. 8 lines 37-43);

associating indicators with the queues to disable the queues (figure 9, col. 13 lines 7-26);

and

comparing scheduling values of queues which are not disabled before the data packets therefrom (figure 8, col. 12 lines 25-28).

For claim 68, Bauman et al. disclose memory queue with adjustable priority and conflict detection, comprising:

queues storing data packets to be forwarded (figure 5, col. 7 lines 44-46); and

scheduling means for selecting queues from which packets are forwarded (figure 5, col. 8 lines 37-43), the scheduling means comprising:

scheduling values associated with the queues (figure 8, col. 12 lines 4-7);

Art Unit: 2665

indicating means associated with the queues for disabling the queues (figure 9, col. 13 lines 7-26); and

comparator means for comparing scheduling values of queues which are not disabled to forward data packets therefrom (figure 8, col. 12 lines 25-28).

6. Claims 28, 61 and 70 are rejected under 35 U.S.C. 102(e) as being anticipated by Henrion et al. (U.S. patent 6,469,982 B1).

For claim 28, Henrion et al. disclose method to share available bandwidth, a processor realizing such a method, and a scheduler, an intelligent buffer and a telecommunication system including such a processor, comprising:

queues storing data packets to be forwarded (Figure, col. 9 lines 41-45); and

a scheduler which selects queues from which packets are forwarded (col. 8 lines 5-8), the scheduler comprising:

scheduling values associated with the queues (col. 8 lines 5-8);

a selector by which scheduling values are compared to select packets to be forwarded (figure, col. 8 lines 10-13); and

a scheduling value updater which updates the scheduling value of a queue based on a variable length of a packet in the queue (col. 18 lines 9-12 and col. 18 lines 16-18).

For claim 61, Henrion et al. disclose method to share available bandwidth, a processor realizing such a method, and a scheduler, an intelligent buffer and a telecommunication system including such a processor, comprising:

storing data packets in queues (Figure, col. 9 lines 41-45); and

associating scheduling values with the queues (col. 8 lines 5-8);

Art Unit: 2665

comparing scheduling values to select data packets to be forwarded (Figure, col. 8 lines 10-13); and

updating the scheduling value of a queue based on a variable length of a packet in the queue (col. 18 lines 9-12 and col. 18 lines 16-18).

For claim 70, Henrion et al. disclose method to share available bandwidth, a processor realizing such a method, and a scheduler, an intelligent buffer and a telecommunication system including such a processor, comprising:

queues storing data packets to be forwarded (Figure, col. 9 lines 41-45); and

scheduling means for selecting queues from which packets are forwarded (col. 8 lines 5-8), the scheduling means comprising:

scheduling values associated with the queues (col. 8 lines 5-8);

selecting means for comparing scheduling values to select packets to be forwarded (figure, col. 8 lines 10-13);

updating means for updating the scheduling value of a queue based on a variable length of a packet in the queue (col. 18 lines 9-12 and col. 18 lines 16-18).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

Art Unit: 2665

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 13 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (U.S. Patent 6,560,230 B1) in view of Bauman et al. (U.S. Patent 5,832,304).

For claims 13 and 46, Li et al. does not disclose an indicator associated with each queue to disable the queue from scheduling. In an analogous art, Bauman et al. disclose an indicator associated with each queue to disable the queue from scheduling (figure 9, col. 13 lines 7-26). One skilled in the art would recognized an indicator to use the teachings of Bauman et al. in the system of Li et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use the indicator as taught by Bauman et al. in Li et al.'s system with the motivation being a part of each memory request selected by MUX 86 (col. 12 lines 58-65).

10. Claims 17-18, 20-21, 50-51 and 53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (U.S. Patent 6,560,230 B1) in view of Chow et al. (U.S. Patent 6,438,134 B1).

For claims 17-18, 20-21, 50-51 and 53-54, Li et al. does not disclose scheduling values which represent theoretical transmission times using a weighted-fair-queuing (WFQ) scheduling policy. In an analogous art, Chow et al. disclose scheduling values which represent theoretical transmission times using a weighted-fair-queuing (WFQ) scheduling policy (col. 1 lines 55-56).

Art Unit: 2665

Chow et al. disclose wherein the WFQ scheduling values are updated for variable packet lengths (col. 13 lines 26-27 as set forth in claims 18, 21, 51 and 54).

One skilled in the art would have recognized a weighted-fair-queuing (WFQ) to use the teachings of Chow et al. in the system of Li et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use the weighted-fair-queuing (WFQ) as taught by Chow et al. in Li et al.'s system with the motivation being to assign a weight proportional to its allocated service rate (col. 1 lines 57-58).

Allowable Subject Matter

11. Claims 6-7, 10, 12, 16, 19, 22, 29-31, 39-40, 45, 49, 52, 55 and 62-64 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. Claims 25-27, 58-60 and 69 are allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claim 25, the prior art fails to teach a combination of the steps of:

second scheduling values corresponding to a second scheduling method associated with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues; and

a queue selector by which first scheduling values are compared and second scheduling values are compared to select packets to be forwarded, in the specific combination as recited in the claim.

Regarding claim 58, the prior art fails to teach a combination of the steps of:

Art Unit: 2665

associating scheduling values corresponding to a second scheduling method with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues; and

comparing scheduling values to select packets to be forwarded, excess capacity under the first scheduling method being available for scheduling under the second scheduling method, in the specific combination as recited in the claim.

Regarding claim 69, the prior art fails to teach a combination of the steps of:

second scheduling values corresponding to a second scheduling method associated with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues; and

queue selecting means for comparing first scheduling values and second scheduling values to select packets to be forwarded, in the specific combination as recited in the claim.

Response to Arguments

13. Applicant's arguments with respect to claims 1-71 have been considered but are moot in view of the new ground(s) of rejection.

The applicant argues that Li et al. does not teach or suggest a selection network by which the scheduling values are compare to select packets to forward as is claimed, for example, in the independent claims 1 and 67. The examiner disagrees. Applicant's attention is directed to Li et al. patent at col. 8 lines 35-37 (see figure 5) where Li et al. clearly teach " Schedule 50 then places each packet in a queue (step 104). Each queue 55 is associated with a leaf class."

Contact Information

Art Unit: 2665

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toan D Nguyen whose telephone number is 703-305-0140. The examiner can normally be reached on Monday- Friday (7:00AM-4:30PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Huy Vu can be reached on 703-308-6602. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

TN
T.N.



HUY D. VU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600